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ABSTRACT

For the past two years a survey has been conducted of over 20 junior high school, high school, and college social science courses in order to describe the interrelationships among a number of factors believed to related to classroom achievement. These factors include age and grade level, academic ability, self-concept, personality, and characteristics of the learning environment. It is assumed that both student and course characteristics affect achievement in a course by means of individual and combined effects on the quality and quantity of autonomous learning that students engage in, both in and outside of class. This paper focuses on those aspects of the learning environment that appear to limit student engagement in these activities. Specific focus is on those features that appear to impede engagement in the kinds of activities that are associated with learning and achievement in courses at this level. The courses were analyzed in terms of their demands, supports, compensations, and net demands. Information was gathered regarding course characteristics, student's study activities, and indices of students' academic achievement. Findings are based on: (1) information capacity demands; (2) reading ability demands; (3) verbatum, comprehension, integration and retrieval demands; and (4) stress conditions. Indices of student academic achievement were grades earned at the end of the unit exam, and final course grades. Results of an analysis of the data are displayed in tables pertaining to each of the demand conditions. (JD)

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COURSE-RELATED IMPEDIMENTS TO EFFECTIVE STUDY PRACTICES

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Secondary schools have recently come under attack from a number of sources for the laxity of their requirements. The argument underlying many task force reports and other calls for reform is that current low levels of achievement can be attributed to low expectations and standards on the part of schools. Student achievement can be increased, so the argument goes, by raising academic demands. Suggestions in this regard include increasing instructional time, raising standards, and heightening accountability; these suggestions usually make explicit reference to requirements on the part of students for more independent work and more proficient study behavior (Boyer, 1983; Education Commission of the States, 1983; Goodlad, 1983; National Commission on Excellence in Education, 1983; The College Board, 1985). A similar call for reform has been extended to the elementary school (Bennett, 1986).

These recommendations are somewhat compelling. Many of us harbor disdain for courses, in our experience, that were undemanding "cakewalks" and have fond memories for instructors whose high standards, discipline, and academic rigor put us to the test. Moreover, it is reasonable to assert that if the "going gets tough" everyone will get going in some way that will benefit them academically. Unfortunately, the notion that student performance and achievement will vary directly with the stringency of academic requirements may be an oversimplified idea and is certainly not a substantiated educational principle. There are several considerations that can be raised. First, the effect on achievement of instructional variables in general is usually considered to be quite small as compared to background variables. Wolf (1979), for example, found instructional variables to account for just 6% of achievement variance in his survey compared to the 63% of variance accounted for by student characteristics and other background variables.

Second, results from studies that have examined the effect, on academic achievement, of demands such as increased workload, increased difficulty, increased student responsibilities for learning have generally been equivocal. The lack of consistency across these studies has led some investigators to perform secondary analyses on the available data in order to look for interactions with student characteristics (Clark, 1982; Peterson, 1977; Snow, 1977). Even instructional manipulations that are expected to have beneficial effects on the study activities and achievement of all students do not perform as expected. Take test expectations for example. Some investigators have found that giving students explicit information about the nature of the criterion test affect the time students spent studying (D'Ydewalle, Swerts, & de Corte, 1983) and the strategies they used when studying (Rickards & Friedman, 1978; Womack, Smid & Tuttle, 1980). However, other investigators have found such information to have no effect on students time or methods (Hakstian, 1971).

A third problem with assessing the demand-performance relationship is that, in an academic setting, demands are often accompanied by instructor-provided supports. These supports include such devices as handouts, review sessions, and oral guidance that is intended to help students cope with the demands of a course. A number of investigators have speculated that these "supports," rather than prompting appropriate study behavior on the part of students, act to eliminate the need for such behavior, thus diminishing the effect of the demands (Corno & Mandinach, 1978; Doyle, 1978; Rohwer & Thomas, 1987).

Finally, some demands and even some supports appear to have a debilitating effect on some or all students. For example, increases in competitiveness seems to benefit some students, as far as measured achievement is concerned, while depressing the performance of others (Ames, 1984). Entreaties designed to goad students into facing difficult work demands can backfire and lead students to exhibit defensive behavior such as procrastination, creating excuses for not working, and other counterproductive behaviors (Covington, 1986).

Although research on instructional variables and course characteristics has proliferated over the past twenty years (e.g., Fraser, 1986; Walberg, 1979), this research has not been particularly useful for providing the kinds of guidance that would seem to be necessary in order to implement the kinds of suggestions listed above. This research consists, for the most part, of two kinds of studies. The first is studies that investigate the effect of single classroom factors on learning activities or achievement without regard to interactions with other factors or with student characteristics. A second kind of study is represented by the large-scale survey or process-product investigations. These studies describe a system of factors that are typically quite general. These variables, such as cohesiveness and affiliation tend to be too distant from the day-to-day learning activities that account for achievement variance in the classroom to contribute useful information about functional relationships among demands, learning activities, and achievement.

For the past two years, we have been conducting a survey of over twenty junior high school, high school, and college social science courses. One of the purposes of this investigation, was to describe the interrelationships among a number of factors that we believe relate to classroom achievement. These factors include age and grade level, academic ability, self-concept, personality, and characteristics of the learning environment. According to our model (Figure 1), both student and course characteristics affect achievement in a course by means of individual and combined effects on the quality and quantity of autonomous learning activities that students engage in in and outside of class with respect to that course. In this paper, we will focus on those aspects of the learning environment that appear to influence

student engagement in various autonomous learning activities. More specifically, we will focus on those features that appear to impede engagement in the kinds of activities that are associated with learning and achievement in courses at this level. Two companion papers (Curley and Estrin, 1987; Rohwer & Christopoulos, 1987) focus on course conditions that appear to promote engagement in productive autonomous learning activities. Another companion paper, (Thomas, Iventosch, & Weiss, 1987), presents data on the interaction between course features and student characteristics.

What Are Autonomous Learning Activities?

Autonomous learning activities are activities that are wholly or partly under the control of the learner. These consist of all of the learning-enhancing and learning-impeding activities that students might engage in when involved in a learning event. Learning events include attending to a teacher-presentation, taking part in a discussion, doing homework and in-class assignments, reading, and preparing for a test. For each of these events, autonomous learning, if and when it occurs, consists of thought and behavior that students elect to engage in to direct, manage, or monitor the event. Autonomous or self-directed learning is most clearly evident when students are called upon to learn on their own, as is the case when a teacher assigns a chapter to read and "know" for an upcoming quiz. In this case, students must execute a series of activities in order to meet the demands of the task. These demands are, at a minimum, to allocate time, to decode the words, to comprehend the content, to select content to study, and to make the selected content memorable. But autonomous learning activities are not limited to such out-of-class events. They are also involved when listening to a presentation in class or even when taking part in a drill-and-practice exercise. Students who notice that they don't understand something or that they are having difficulty with a particular skill are engaging in an autonomous learning activity, that of monitoring their learning. Students who are adept at avoiding distractions in class, students who are disposed to request that some aspect of a teacher's presentation that they have not heard or understood completely be repeated or clarified, and students who use self-speech to focus their attention or control negative affect are all engaging in autonomous learning activities (Corno, 1986). Autonomous learning is here defined as a very broad class of learner-initiated and regulated activities that include activities other investigators refer to as studying (Anderson & Armbruster, 1984), metacognitive activities (Brown, 1978), self-regulated learning (Corno, 1986), intentional learning (Bereiter & Scardamalia, 1985), and learning strategies (Weinstein & Mayer, 1986).

Contexts for autonomous learning activities. Autonomous learning activities occur in a variety of contexts. These include at least the following:

In-class contexts	Out-of-class contexts
o attending to teacher presentations	o doing assigned reading
o doing labs, worksheets, and other in-class assignments	o doing written assignments and other homework
	o preparing for a test

Some of these contexts may appear to be highly teacher-directed. Nevertheless, each provides a great deal of latitude for students to engage in self-directed activities. For example, when listening to a teacher's presentation, some students may elect to ask a question when the teacher presents something that they don't understand. Other possibilities, in this same situation, include making a note of things that are difficult to understand, asking a classmate, using resource materials, or, of course, taking no action at all.

Types of autonomous learning activities. Self-directed learning consists of activities that are engaged in for a variety of purposes. In the broadest analysis, two kinds of activities can be distinguished: cognitive activities that serve to facilitate the processing and transformation of information for the purpose of learning, and self-management activities that serve to manage the learning process across tasks and time. Cognitive activities are divided into five classes: selection, comprehension, memory enhancement, integration, and cognitive monitoring. Self-management activities are divided into three classes: effort management, time management, and volitional monitoring. Table 1 displays these classes of autonomous learning activities.

What are course characteristics?

According to our model as displayed in Figure 1, students' engagement in autonomous learning activities is affected by characteristics of the course. Given the variety of autonomous learning behaviors that may be involved in a study event, the number of course (text, test, lecture, assignment) features that might affect the quality and quantity of those activities is quite numerous. In order to try to make sense of this complexity, we have devised a framework for analyzing courses in terms of their demands, supports, compensations, and net demands. (Table 2 presents a listing of the course features investigated in the present study along with an indication of sources of data for these features.)

Demands are characteristics of the course that would seem to set requirements on or prompt autonomous learning activities on the part of students. These requirements can be direct and explicit as is the case with courses that are characterized by many, long reading assignments. Requirements can also be indirect and implicit, as is the case with courses that weigh test performance heavily in determining the overall course grade.

In this case, the greater the importance of examinations, the greater the demand, presumably, for students to engage assiduously in information processing and other test preparation activities.

Supports are characteristics of the instructional environment that serve to mediate the effect of demands. Supports prompt or encourage students to engage in the cognitive or self-management activities necessary to cope effectively with the demand. Examples of potential supports include instructor suggestions regarding study strategies, focus questions in the text, and opportunities to improve grades by repeating examinations. Compensations, according to our framework, are instructional aids that have a supportive intent, typically, but fail to prompt students to engage in the desired autonomous learning activity. Examples of potential compensations are instructor provided handouts that contain the very answers required on a subsequent examination and teacher-provided integrative summaries of material. Compensations of this kind should obviate the need for students to engage in anything but rote processing.

Using the constructs of demands, supports, and compensations, it is possible to derive an index of net demands that can be used to describe courses in terms of the demands they make on autonomous learning activities when the supports or compensations relevant to particular demands are taken into account (demands minus supports or compensations) For example, an instructor who assigns a difficult text for outside reading that is accompanied by handouts that provide summaries of chapters from that text (compensation) has reduced the net demand on students processing activities appreciably.

Additionally, the framework was designed to enable us to distinguish two kinds of demands or supports: (1) cognitive--those that pertain to the type of processing of material that students would need to perform while studying and (2) self-management--those that pertain to time and effort investment in studying.

Impediments

Impediments are classroom practices, including characteristics of materials, goal stuctures, and testing practices that either fail to promote student engagement in productive learning activities or that promote engagement in unproductive activities. Productive learning activities include those specific activities that serve to (a) select out important information, (b) enhance comprehension of new or difficult material, (c) elaborate or differentiate material for memorability, (d) integrate material to be learned with other material, (e) monitor the learning process, (f) foster concentration and effort, and (g) insure that sufficient time is apportioned for studying. Unproductive learning activities are those that have little value for the

above functions and include repetitive, duplicative processing, unselective processing, and a host of self-management difficulties such as procrastination, perseveration, and tendency to be distracted from the task.

Impediments can be operationally defined in three ways. The first two ways take into account the effect of course features on engagement in various classes of autonomous learning activities. From this point of view, impediments occur when a course feature or combination of features acts to (1) discourage engagement in one or more productive learning activities or (2) prompt engagement in one or more unproductive activities. The third definition of impediments takes the criterion and criterion-relevant performances into account. From the point of view, an impediment occurs when a course feature or combination of features (3) fails to prompt the majority of students to engage in cognitive or self-management activities that are engaged in spontaneously and effectively by the most successful students in the course. A hypothetical example of this last form of impediment is the case where instructor-provided lists of facts prompt most students to engage in rote memorization of the items on these handouts, a strategy that puts most of the class at a disadvantage on a subsequent essay examination. In this case, an analysis of what study activities were most effective for this class might yield a high correlation for more constructive, integrative processing activities.

Method

Participants. The present investigation was conducted in the Fall of 1985 and the Spring of 1986. Students from two universities, four high schools, and three junior high schools participated in the study. A total of 22 instructors and 1242 of the 1656 students enrolled in these courses was surveyed. At the college level, two courses were sampled, one in American history and one in European history (two instructors and 283 students participants). At the high school level, 530 students participated from courses taught by nine instructors in either American history or government. At the junior-high school level, all 417 students were enrolled in an American history course. A total of eight instructors were included from this level. Wherever possible, a feeder relationship was maintained between the participating high schools and junior high schools. Where the relationship could not be maintained, an attempt was made to find a junior high school which matched the high school district demographically . The high schools sampled were known feeders to the universities included in the study.

Instruments and Procedures

Information collected from this sample pertaining to three major classes of variables was used to address the questions outlined above: (1) information regarding course characteristics; (2) information regarding students study activities; and (3) indices of students' academic achievement.

Course Characteristics

Instruments Used to Assess Course Characteristics. For each course, information regarding course characteristics and instructional practices was derived from four sources: classroom observations, document analyses, a student questionnaire, and a teacher questionnaire. (See Table 2.) Analyses and results reported in this paper draw most heavily on information from the first two sources. Descriptions of the other sources are included in a companion paper (Strage and Tyler, 1987).

a. Classroom observations. Project staff observed and audio-taped each course on three occasions. Two of these observations were made on days of routine instruction, no less than two weeks preceding the end-of-marking-period examination (ObsR1 and ObsR2). The third observation was made on the last class day before the test (ObsT). For one of the routine sessions, (ObsR2), and for the session immediately preceding the test, two members of the project staff observed together.

Field notes from these observations were transposed onto summary log sheets that rated class sessions overall and individual instructional topics covered during the session. Overall ratings included: (1) availability of the instructor to students; (2) instructor's responsiveness to students' questions; (3) the degree to which the instructor encouraged student comprehension; (4) the degree to which the instructor encouraged students to integrate material; and (5) the amount of advance notice the instructor gave students about the end-of-unit test. Instructional topics were rated along the following 10 dimensions: (1) whether material presented was new or already covered elsewhere; (2) the number of sources where that information was covered; (3) organizational frameworks provided for the lecture (outlines, advance organizers); (4) cues introduced to highlight important information (flags for key points); (5) the manner in which topics were treated (integrative or factual); (6) the number of examples provided; (7) whether and how the instructor checked on students' comprehension or entertained students' questions; (8) whether the instructor provided summaries of topics, transitions, or recontextualizations for topics; (9) whether the instructor offered strategies for completing assignments or for reviewing particular topics for the test, and if so, what sorts of strategies they offered; and finally (10) how long the coverage of each topic lasted.

Log sheets corresponding to class sessions where two observers had been present (ObsR2 and ObsT) were completed independently by each

observer. A third log sheet for those sessions was then completed, representing a consensus between the observers. The consensus log sheets were used for all subsequent analyses involving Obs R2 data.

Additionally, transcripts of 5-7 minutes of Obs R2 were prepared. These transcripts consisted of verbatim records of instructors' lectures covering two or three instructional topics, prepared using standard orthographic conventions. These transcripts were then rated along three dimensions: (1) pace of information presentation (number of teacher words per minute); (2) familiarity of vocabulary (word frequency, according to Carroll word frequency norms); and (3) comprehensibility (concreteness of a sample of nouns drawn from the transcripts as well as overall comprehensibility) as rated independently by three raters who had not been present at the class session itself). Where ratings were performed by multiple judges, means of these ratings were taken and used for subsequent analyses.

b. Document analyses. All assigned readings, handouts, and tests pertaining to the marking period in question were collected for each course. Readings were rated along the following 7 dimensions: (1) number of sources from which readings were drawn; (2) average number of words assigned per day; (3) familiarity of vocabulary (word frequency for a sample of nouns, verbs and adjectives, according to Carroll word frequency norms); (4) cues for selection of important content (presence and adequacy of previews, summaries and adjunct questions for selecting inportant points); (5) comprehensibility of readings (concreteness of a sample of nouns and t-units drawn from the reading), presence and adequacy of previews, summaries, adjunct questions, examples, and definitions as supports for comprehension; (6) presence and adequacy of mnemonic devices (charts, tables, lists, etc); and (7) extent and manner of integration (explicit vs. implicit) of material within and between sources. For all subjective ratings, three judges performed the ratings independently. Their scores were averaged, and all subsequent analyses were based on this mean score. Three additional ratings were obtained for each reading assignment: (1) the number of words per assignment, and estimates of the (2) time and (3) effort needed to complete the assignment.

Tests were rated by two independent raters on three dimensions: (1) proportion of points associated with rote items; (2) proportion of points associated with comprehension items; and (3) proportion of points associated with integrative items. Additionally, teachers were asked to indicate, on the test form, the weight of the exam in determining the final course grade and whether grading criteria were absolute or normative.

Readings and tests, taken together, were then rated along 5 dimensions to measure the congruence between the content and presentation of material

in the readings and that in the test: (1) number of details in the readings appearing or called for on the test (1 rater); (2) proportion of answers to test questions located in the readings (2 raters); (3) proportion of test items that paraphrased material presented in the readings (2 raters); (4) predictions, for a random sample of details drawn from the readings, of the likelihood that each would appear on test covering the particular chapter (3 raters); (5) ratings, for each test item, of whether answers had been covered in the readings, and if so, whether the test item used the same wording as the readings, a paraphrase of that wording, or inferences from the reading (3 raters).

Handouts and tests, taken together, were rated along 3 dimensions similar to those used to rate readings and tests: (1) whether test item or its answer had been mentioned on the handout (1 rater); (2) how the test item material had been treated in the handout (factual, comprehension, integration)(2 raters); and (3) the similarity in treatment of the material on handouts and in test questions (3 raters). As with other ratings, means were taken of multiple raters' scores and used for subsequent analyses.

Procedures for Analyzing Course Characteristics Three profiles were derived for each course, one based on classroom observations and document analyses, a second based on students' responses to the Course Characteristic Survey, and a third based on instructors' responses to the Teacher Questionnaire. As described briefly above, the framework for assessing course characteristics is based on two dimensions: (1) demands versus supports: aspects of the course that constitute requirements for student performance versus aspects of courses that constitute aids that serve to help students meet those requirements, and (2) cognitive versus self-management: aspects of the course that are related to cognitive or information-processing activities versus aspects of the course that are related to the amount and quality of effort engagement over time. Profiles of each course were made up from a set of 32 features used to index cognitive and self-management demands and supports. These features consisted of means of various objective ratings (for classroom observations and document analyses). Table 2 names and describes these features, and identifies the informational sources from which they were derived.

Profiles derived from classroom observations and document analyses: Algorithms were written to compile ratings of both classroom sessions and documents analyzed for each course, corresponding to each feature for which information could be derived from these researcher ratings. Table 3 lists, for each feature, the rating(s) of classroom observations and document analyses entered into the algorithms. Application of these algorithms to ratings standardized across courses

yielded scores for each course on 28 features. A final objective rating for each feature was then computed for features where ratings were available from both observations and documents. In most cases, averages from these two sources were used. In cases where ratings from only one of those sources were available or possible, the score from the single source was used as the final feature score.

Intercorrelations among feature scores were then computed in order to identify potential feature "factors" that would both show a positive correlation across courses and have some construct value for subsequent analyses. Seven such demand factors and six support or compensation factors were identified. These composite demand features consist of (1) demand for information capacity, (2) demand for reading ability, (3) demand for verbatim processing, and (4) demand for comprehension, (5) demand for integration, (65) demand for retrieval, and (7) stress conditions. Composite support features consist of (1) selection supports, (2) comprehension supports, (3) memory supports, (4) integration supports, (5) time and effort supports, and (6) exam performance supports.

Study activities

The Study Activity Survey. The Study Activity Survey was administered to all participating students in order to assess their degree of engagement in different kinds of study activities. The first part of this inventory, Form R, consists of 102 items (mostly 5-point scale Likert-type items). Form R asks students to report on the sorts of study activities they engage in while studying for a particular course on a routine basis. The second part of this inventory, Form T, consists of 121 items (also mostly 5-point scale Likert-type items), asking students to report on the sorts of activities they engaged in while studying for the end-of-marking period test. The questions on both forms of the inventory pertain to both in-class and out-of-class activities engaged in while listening to presentations, doing reading assignments or studying notes.

The items on the Study Activity Survey reflect the sorts of study activities students might engage in in order to (1) select important information, (2) comprehend lectures and study material, (3) commit that material to memory, and (4) integrate material within or across informational sources. Additionally, items ask students to evaluate their own cognitive and self-management ability in that course. In all, the items on the Study Activity Survey are categorized into 16 scales, 12 of which correspond to types of cognitive/transformational activities, and 4 of which correspond to types of self-management activities. Table 3 lists and defines these scales, and indicates the form(s) of the survey on which relevant items appear.

Academic achievement

Two indices of student academic achievement were collected in the present study: grades earned on the end of unit exam (Zt Grade), and final course grades (Zc Grade).

Procedure for the Collection of Data As mentioned above, all data collected and analyzed for this study pertained to one entire marking period. Before the beginning of the marking period, project staff visited each participating course, and briefly described the study. For all courses, observations of routine class sessions were conducted at least 2 weeks prior to the end-of-marking period exam, on days when typical classroom activities were planned, and the third observation was conducted on the last class day before the exam. Test and final course grades were collected as soon as they were available. For all participating secondary school courses, information concerning student study activities and student perceptions of their courses was collected during two class periods. Form R of the Study Activity Survey and Form R of the Course Characteristic Survey were administered together at least two weeks prior to the end-of-unit exam, and Form T of the Study Activity Survey and Form T of the Course Characteristic Survey were administered together at the first class meeting immediately after the exam. At least one project staff memeber was present for, and supervised these administrations.

Analysis Technique

The resulting data set is both large and complex, and is designed to serve as a data base for subsequent investigations of experimental hypotheses. To date wer have undertaken a number of preleiminary analyses, several of which are described in companion papers (Rohwer & Christopoulos, 1987; Strage & Tyler, 1987; Thomas, Iventosch, & Weiss, 1987; Jensen & Walker, 1987; Curley & Estrin, 1987). Our focus for this paper is on the relationships betweeen course characrteristics and the engagement in and effectiveness of various classes of autonomous learning activities.

Our strategy for examining these relationships includes four parts. First, our early analyses have convinced us that some course characteristics and some study activities operated differently at different educational levels. Thus we have analyzed data separately for our junior high school and high school samples. Thecollege sample is not examined in this analysis due to the small number of separate courses sampled at this level.

Second, we have chosed ot limit our focus in this paper to study activities related to test preparation. Twelve of the sixteen autonomous

learning activity categories are represented on the form of our instrument designed to survey this facet of studying. Patterns of relationships asociated with routine studying will be reported at some later date.

Third, we have defined effectiveness in terms of the extent to which students in the top tertile of a course engage in a given category of autonomous learning activities. Mean engagement values for each class of activities for each course were then standardized across the total sample of courses and correlated with similarly standardized values for course features. The relationship between course features and engagement in categories of activities was indexed by correlating these same standardized values for course features with standardized mean activity levels for all students in each course.

Finally, three types of course features were constructed for each of seven dimensions of course characteristics: Information Capacity, Reading Ability, Verbatim, Comprehension, Integration, Retrieval and Stress (Table 3). The three types of course features are raw demands, supports, and net demands. Raw demands are course features that presumably tax a given capability. supports are course features that presumably help students cope with an associated demand. Net demands are raw demands adjusted for supports. These were calculated by subtracting the standardized value of supports in a course from the demands they are thought to influence.

Results

Results of our analyses appear on tables 4-10. Each table displays data pertaining to one of the seven demand conditions described above. Each table includes both effectiveness and engagement correlations for ten classes of study activities and two indices of self-evaluation. In addition, each table displays these correlations for three indices of demand context: absolute demand, level of support on selected features presumed to aid students to cope with the particular demand, and an index of net demand, which is absolute demand adjusted for level of support provided. In each table, results for the nine junior high schools and the eleven high schools are listed separately. Scores for study activity scales are based on individual students; scores on the three demand indices are based on standard scores for courses as a whole.

Given the small sample sizes (for the indices of demands) and the inherent instability of correlations of correlation coefficients under such conditions, results will be reported and interpreted cautiously with the prime focus on the generation of hypotheses to be examined in future analyses and subsequent studies. Our strategy for attempting to make sense of the data presented in tables 4-10 will be to look first for patterns involving correlations between demand features and study activity scales

that were found to be significant at p.<.05. As appropriate, effects that fall below that significance level will be reported when they suggest hypotheses that can help to explain overall patterns.

In our analysis, impediments are thought to arise when (a) a putative demand prompts behavior that is apparently unproductive with respect to that demand, (b) an instructor-provided support that is intended to help students cope with a particular demand fails to increase students engagement in activities that should be expected to meet the demand, (c) the support increases engagement in other activities that are not expected to be productive with respect to the demand, or (d) the demands or supports characteristic of a course fails to increase students engagement in the kinds of activities found to be effective under those demands or support conditions. Only this third definition of impediment is grounded in an empirical analysis. The first two definitions rely on commonly held beliefs about the expected consequences of different demands or appropriate versus inappropriate behavior necessary to cope effectively with demands.

Demand for information capacity Information capacity refers to the amount of information that must be learned for a test. In our analysis of course features, information capacity demands are a combination of two feature scores: information load and number of details (See Table 2). Associated supports include the presence of a principle for selection, instructor-provided selection supports, and instructor previews for reading assignments. Data pertaining to the relationship between demands, supports, and net demands on the one hand and study activities on the other are presented in Table 4.

At the Junior High level, effective performance is related to a positive self-evaluation of cognitive and self-management capabilities under conditions of high demands on information capacity (r=.69). Under these conditions, Uniform (i.e., non-selective) Processing is also associated with achievement (r=.70), a finding that runs counter to expectations. There is also some indication that high demands on information capacity increases engagement in the one kind of activity that is effective in these situations (unifrom Processing).

Selection supports, which should, presumably, help students distinguish more from less important information, also increases engagement in Uniform Processing (r=.79). In addition, these supports also significantly increase engagement in Cognitive Monitoring, activities that Focus on Test Relevance, Interpretive Processing, and Selective Notetaking. Thus, selection supports, at this level, appear to encourage students to be unselective in processing while being selective in other aspects of studying. Of interest in

this analysis is that whereas selection supports increase engagement in activities (with the exception of Uniform Processing) that would seem to help students cope effectively with high information load and a high number of details, these activities are not highly related with effectiveness in these settings. Moreover, when you look at the degree of effectiveness associated with these activity scales under high support conditions, there are no relationships between supports and activities that reach significance. One possible explanation of this result that comes under the heading of a possible impediment is that under high support conditions, it may not be necessary for students to engage in study activities in order to achieve.

At the High School level, no one of the activities assessed were associated with achievement under conditions of high information capacity demand. Under high support conditions, three types of study activities are associated with effectiveness: Uniform Processing (r=.68), Cognitive Monitoring (r=.69), and a Focus on Test Relevance (r=.67). Selection supports do not increase students engagement in the very activities that are effective under these supportive conditions.

Demands on reading ability The demand on reading ability pertains to the relative difficulty of the reading material in a course in terms of vocabulary, sentence complexity, and comprehensibility. Supports for this demand, according to our analysis, include aids provided by the instructor or embedded in the text that were designed to help students enhance their comprehension or remedy comprehension problems. Data pertaining to demands, supports, and net demands with respect to reading ability are displayed in Table 5.

At the Junior High School level, demand per se does not have a significant effect on engagement in any type of study activity. Likewise, no one of the study activities is significantly related to achievement under conditions of high demand for reading ability. The same pattern emerges for supportive conditions with respect to reading ability. However, when you consider net demands (demands minus supports), an index that may be more meaningful in this case since demands and supports for reading ability are highly correlated in the sample, two correlations reach significance. Under conditions where the demands are high and supports are relatively low, engagement in Uniform Processing (r=-.59) and Cognitive Monitoring (r=-.70) activities is significantly discouraged. From an impediment point of view, it appears that as the demand for reading ability increases, students become less likely to engage in activities that should be expected to be productive with respect to that demand, e.g., to keep track of what they find difficult to understand.

At the High School level, demands on reading ability fail to affect students engagement in any of the types of study activities assessed.

Supports also seem to be unrelated to engagement. However, under conditions of high demand without regard to supports four types of activities are associated with effectiveness in terms of course achievement: two high effort resource management activities (Assiduous Resource Management, r=.68, and Means for Resource Management, r=.72), one index of deep processing (Interpretive Processing, r=.86) and one index of superficial processing (Duplicative Processing, r=.64). One interpretation of this finding coupled with the lack of relationship between demand and engagement is that with increases in combined demands and supports for reading ability (which is the typical case), only high ability students discover and employ effective study strategies.

Verbatim demands Verbatim demands pertain to the presence of criterion tasks that emphasize the reproduction of factual information covered in class and in the readings. Supports for verbatim demands, include drill and practice questions, and instructor provided memory or mnemonic supports. Data related to Verbatim demands is displayed in Table 6.

At the Junior High level, only positive self evaluations of one's cognitive (r=.69) and self-management (r=.89) capabilities were associated with effectiveness under high demand conditions. High verbatim demands increased students engagement in Duplicative (rehearsing, rereading) Processing activities (r=.77), but not Verbatim Processing activities (mnemonics) which are presumably more effective for rote learning. It is interesting to note, though inexplicable, that under high net demands for verbatim processing, most of the activities that would seem to be associated with success are negatively related to effectiveness.

At the High School level as well, engagement in study activities is relatively unaffected by variations in verbatim demands, except for the finding that supportive conditions tend to decrease engagement in activities that promote effort (Means for Resource Management, r=-.62). Variations in verbatim demands also failed to affect the effectiveness values of the different study activity scales. This lack of findings at the High School level is possibly attributable to a lack of variability at this level in verbatim demands. However, this will need to be investigated emprically.

Demands for comprehension Comprehension demands pertain to the presence of criterion tasks that require students to exhibit evidence of their comprehension of information or concepts introduced in the lectures or readings. Associated supports include a variety of comprehension supports such as the presence of instructor- or text-provided summaries and

instructor-led reviews. Data related to Comprehension demands is displayed in Table 7.

At the Junior High School, increases in the demand for comprehension are associated with decreases in students engagement in Cognitive Monitoring activities, both when demand is considered without regard to supports (r=-.71) or when the effect of supports is subtracted from that of demands (r=-.70). High demand for comprehension also tends to reduce students engagement in activities that Focus on Test Relevance (r=-.65) and high net demand reduces students engagement in Uniform Processing (r=-.59). At the same time, there is little relationship between the effectiveness of particular study activities and variations in comprehension demands with the exception of high cognitive self regard when supports are high (r=.77) and low cognitive self regard when net demand is high (r=-.79). So, on the one hand, increases in comprehension supports decreases engagement in jus those activities that would be expected to be useful in coping with high comprehension demands, and on the other hand, students who are most confident of their cognitive abilities are most ineffective under conditions where demands increase without associated supports.

There appears to be few relationships worth reporting between comprehension demands and study activities for the high school sample except that for Uniform Processing. The presence of comprehension supports tends to increase engagement in Uniform Processing (r=.69).

Integration demands Integration demands pertain to the presence of criterion tasks that require students to draw inferences and to construct relationships among facts and concepts covered in lectures or readings in a course. Supports for integration include suggestions, exercises, and examples that encourage students to relate ideas to one another, e.g., compare and contrast. Data related to integration demands is displayed in Table 8.

For the Junior High sample, both demand for integration and provided support for integration reduce students engagement in Duplicative Processing activities (r=-.71, r=-.73, respectively). However, increases in neither demands or supports acts to increase engagement in activities that one might expect to be appropriate for integrative demands, namely, Constructive Processing and Interpretive Processing activities. Note that Increases in integration demands are also associated with a reduction in self evaluation ratings for Self-Management Capabilities (r=-.69).

At the High School level, increases in demand for integration was found to increase students engagement in Assiduous Resource Management (r=.54) and Cognitive Monitoring (r=.56) activities, while increases in net demands increased students engagement in Assiduous Resource Management activities (r=.57) and decreased engagement in Duplicative Processing activities (r=-.55). There were, however, no significant

correlations between study activities and integration demands or supports with respect to effectiveness. At the High School level, variations in integration demands do not affect the effectiveness of different study activities. As was true for the Junior High sample, there was no indication that increases in integration demands or supports increased engagement in deep level processing (Constructive or Interpretive) activities, now were these activities effective under these conditions.

Retrieval demands Retrieval demands are defined as a combination of length of retention interval (the length of time between tests) and exam weight (how important the exam is in terms of the overall course grade). Supports for retrieval demands (which involved a composite feature referred to as Exam Performance in our analysis) included the extent to which information covered in the exam is similar in content, format, and treatment to information covered explicitly in the reading or instructor-provided handouts. Data related to retrieval demands is displayed in Table 9.

At the Junior High School level, high demands for retrieval were found to increase engagement in a number of activities: Uniform Processing (r=.82), Assiduous Resource Management (r=.69), Cognitive Monitoring (r=.63), Constructive Processing (r=.75), Interpretive Processing (r=.70), and Selective Notetaking (r=.76). The presence of supports for retrieval demands tended to decrease engagement in Assiduous Resource Management (r=-.68), hence the pattern for high net demands is similar to the pattern for demands considered alone with an even greater increase for Assidous Resource Management (r=.88). Other significant correlations for engagement under high net demand conditions were Uniform Processing (r=.67), Cognitivde Monitoring (r=.58), Constructive Processsing (r=.78), and Selective Notetaking (r=.71). High retrieval demands appear to increase engagement in just those activities that you would expect to be necessary in order to cope with retrieval demands. However, the effectiveness data fails to confirm this expectation. Engaging in the activities listed above is no more likely to insure success than engaging in other activities. The sole exception is Selective Notetaking which was found to be associated with high achievement under high net retrieval demands. Under conditions of high support for retrieval demands (which in this instance are instructor-provided compensations for learner-directed activities), successful students are those that refrain from engaging in Selective Notetaking (r=-.80) and who do not engage in (or who do not need to engage in) techniques to manage academic effort (Means for Resource Management, r=-.77).

At the High School level, a very different pattern was evident. With an increase in the demands on retrieval, there is a decrease in Duplicative Processing (r=-.62), but no significant increases in engagement in any study activity scale. Moreover, with increases in demand for retrieval, successful

students are those who engage in less Constructive Processing (r=-.73). With increases in retrieval supports, there is an increase in the importance of Uniform Processing (r=.61) and Assiduous Resource Management (r=.62) for achievement ; and with increases in net demands, there is a decrease in the importance of Assiduous Resource Management (r=-.61).

Stress Conditions Stress conditions are defined by a single feature, the presence of competitive grading. Supports for stress include teacher-directed efforts to reduce the demand of examinations by means of providing the content of and information about the exam in advance of the exam and by constructing the exam in such a way that it is congruent to the material presented in the readings or handouts. Data concerning stress condition are presented in Table 10.

There is little evidence, either at the Junior High or High School level that competitive grading increases engagement in any of the study activities investigated in the study. With regard to net demands, which in this case would be an index of competitive grading with minimally congruent tests, there was a significant decrease in Constructive Processing (r=-.60) and Verbatim Processing (r=-.60), as well as a decrease in Self-Evaluation of Cognitive Capability (r=-.60), evident at the High School level. The only significant correlation for the relationship between stress conditions and the effectiveness of study activities occurred for the Junior High sample where with increases in support for exam performance, successful students engage in Verbatim Processing (r=.69).

Discussion

A companion paper, (Curley & Estrin, 1987), focuses on study activities associated with effectiveness as a function of grade level and demand conditions. This discussion of the results displayed in Tables 4-10 will be largely limited to implications of the data for revealing course features that serve to impede students engagement in "productive" learning-enhancing study activities.

Some caution must be expressed again about the notion of impediments. Impediments are defined, in the present analysis, as a situation where (a) a putative demand prompts behavior that is apparently unproductive with respect to that demand, (b) an instructor-provided support, that is intended to help students cope with a particular demand, fails to increase students engagement in activities that should be expected to meet the demand, (c) a support increases engagement in other activities that are not expected to be productive with respect to the demand, or (d) the demands or supports characteristic of a course fails to increase students engagement in the kinds of activities found to be effective under those demands or support conditions.

As noted earlier, only this third definition of impediment is grounded in an empirical analysis. The first three definitions of impediment are based on a priori expectations concerning the purposes and implications of demands and supports. As a consequence, inspection of the engagement data alone may lead to conclusions that are then contradicted when effectiveness data are considered. For example, consider the situation where neither an increase in demands or supports for integration is associated with increases in students engagement in Constructive Processing activities. This was the observed result according to the results displayed in Table 8. This could be viewed as an impediment according to the above definition in the sense that putatively important activities (summarizing, outlining, reducing notes, making diagrams) were not increased as a function of increases in integration requirements or increases in the presence of integration aids. The interpretation might be that what should have happened failed to happen. However, an examination of the effectiveness data could reveal, as it does in this case, that in situations of increased demand or supports, the putatively important activity in the former case or prompted activity in the latter case is not what is important at all with respect to the demand. Keeping this contradiction in mind, some of the more remarkable findings from the data reported above include the following.

Information Capacity Demands 1. Increasing information load and the amount of details students must process does not, at either grade level, increase the kinds of activities students might engage in order to deal with volumes of information or to separate important from less important information. 2. In fact such increases tend to decrease Cognitive Monitoring, at least at the Junior High Level. 3. The provision of supports does increases what appear to be appropriate kinds of activities (Cognitive Monitoring, Focus on Test Relevance), but only at the Junior High School level. 4. At the High School level, the effectiveness data reveal that students who do well engage in monitoring and test-focused processing, but this is true only under high support conditions.

Reading Ability Demands 1. Variations in such features as the difficulty of reading material do not serve to alter students engagement in study activities to any great degree except to decrease such activities as Cognitive Monitoring at the Junior High School level. 2. At the High School level, increasing the demands for reading ability tends to increase the importance of self-management methods and the requirement for assiduous effort while simultaneously increasing the importance of duplicative processing and interpretive processing. Apparently, when the "going gets tough" with respect to difficulty of the material, it makes sense to be diligent, repetitive, and to try to enhance your comprehension. However, there is no indication that increasing difficulty will increase students engagement in these or any other activities, with or without supports.

Verbatim demands 1. Increasing the demands for rote processing and reproductive responding tends to increase engagement in Duplicative Processing at the Junior High School level. This pattern of demands was quite evident at this level and the frequency with which students reported engaging in such methods as rereading, copying notes, and rehearsing was relatively high as well at this level. 2. It is interesting to note, however, that neither duplicative nor verbatim processing were associated with achievement in verbatim demand conditions at either level.

Comprehension demands 1. Increasing the demands on students to exhibit their understanding of ideas and to interpret rather than reproduce information inexplicably results in a decrease at the Junior High level in all of the activities that one might believe would be helpful in coping with these demands (e.g., cognitive monitoring) and fails to increase engagement significantly in any activity at the High School level. 2. Supports designed to help students comprehend or to prompt comprehension-enhancing activities do not significantly increase those activities at either level. 3. A possible explanation for these findings may lie in the lack of variability in comprehension demands observed in secondary schools; most courses required the reproduction of facts, not the comprehension of ideas. Moreover, where comprehension demands were observed, they were invariably associated with matching comprehension supports, e.g., essay questions requiring students to compare the readiness of the North and the South for thee War Between the States that followed by two days an instructor-provided handout listing differences in preparedness on the part of the two sides. The tendency to provide compensatory material for demands such as those for comprehension may have effectively eliminated the effect of the demand.

Integration demands 1. Increasing the demands for integration at the tends to decrease activities that might be expected to be ill suited to these demands (Duplicative Processing and Verbatim Processing) 2. Neither incrasing demands nor increasing supports has much effect on students engagement in integrative activities (Constructive Processing, Interpretive Processing) 3. Increasing integration demands tends to decrease students self regard evaluations, which is a possible clue that high integration requirements is an unfamiliar, perhaps uncomfortable situation for students and one that evokes assiduousness, but little strategic behavior. 4.. Supports for integration also fail to increase integrative activities. 5. Again, as stated for comprehension demands, the absolute demand for integration was observed to be quite low in the samples observed, especially when the presence of matching, compensatory supports is considered.

Retrieval demands 1. Retrieval demands did appear to have an effect on cognitive processing activities at the Junior High level, but not at the High School level. Further analyses will be required to explain this effect and to

determine whether the features that make up the retrieval composite are differentially implicated in the effects at one grade level versus the other. 2. Supports for retrieval demands significantly reduce Assiduous Resource Management activities That is, reducing the real challenge posed by the examination through the provision of exam-congruent material prior to the exam serves to reduce student effort. There is also indication that such supports alters the quality of students processing activities in the direction of increased Duplicative Processing and decreased Constructive Processing. 3. At the High School level, inexplicably, increases in either demands or supports decreases student engagement in almost every kind of processing activity.

Stress conditions Competitive grading appears to have little effect on students engagement in study activities except to depress engagement universally. A significant decrement associated with stress conditions occurs at the High School level where increases in stress conditions are associated with a decrease in Constructive Processing.

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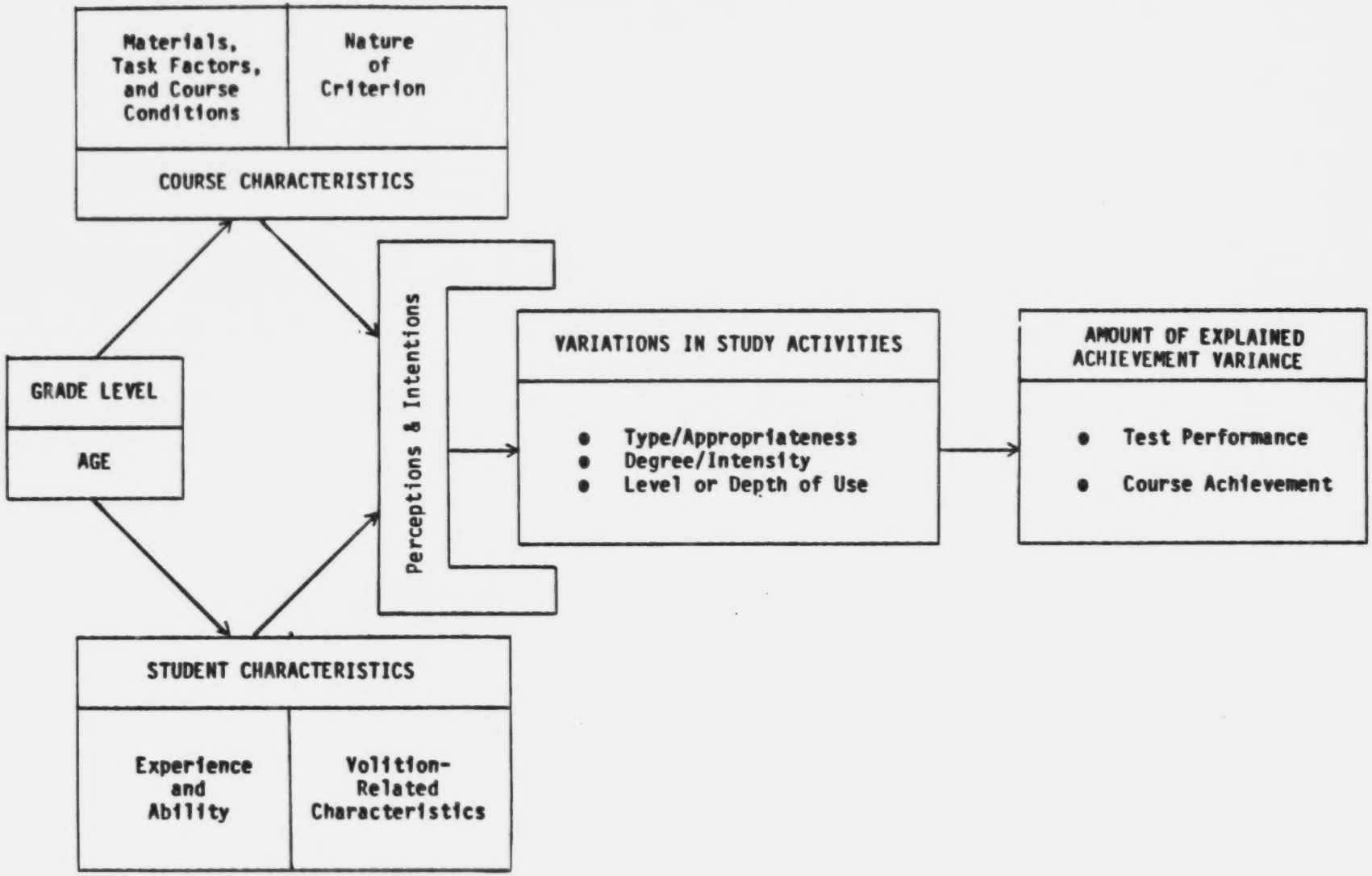

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Figure 1. A model for the research study depicting possible relationships among course characteristics, student characteristics, study activities, and achievement.

Table 1

Characterizations of Cognitive and Self-Management Scales of the Study Activity Survey: Forms R (Routine) and T(Test Preparation)

Cognitive Scales

Name	Form	Characterization
Duplicative Processing	R,T	Unaltered re-encoding or mental recycling of previously encountered information.
Receptive Processing	R	Reception of information given in texts or by instructor without implication of further processing.
Uniform Processing	R,T	Non-selective processing of all the information at hand, voluntarily, intensely, or earnestly.
Generation of Constructed Information	R,T	Elaborating, reorganizing, contrasting, integrating, or summarizing newly encountered, previously recorded or encoded information.
Generation of Interpreted Information	R,T	Explicating, investigating, or inquiring into the meaning of target information to enhance comprehension or memory.
Generation of Verbatim Information	T	Elaborating or transforming mental modality of target information to enhance memorability.
Hyperprocessing	R	Self-initiation of extra processing of information that is anticipated to present comprehension or memory difficulties.
Cognitive Monitoring	R,T	Active checking of one's own state of comprehension or memory for information.
Focus on Test Relevance	R,T	Self-initiated investigation, identification, and allocation of processing to information that is likely to be important for a test.
Pre-Reading Preperation	R	Planning for selection prior to reading.
Selective Noteteking	R,T	Purposeful recording of information selected on criteria of difficulty or substantive relevance.
Self-Evaluation of Cognitive Ability	R,T	Characterizes self as able and knowledgeable in dealing with challenging cognitive tasks.

Table 1 (cont.)

Characterizations of Cognitive and Self-Management Scales of the Study Activity Survey: Forms R (Routine) and T(Test Preparation)

Self-Management Scales

Name	Form	Characterization
Assiduous Resource Management	R,T	Voluntary, intense, or earnest preparation for or application of one's energy to the task or activity at hand.
Means of Resource Management	R,T	Using specific procedures for managing time and effort in contrast to worrying about managing them.
Self-Evaluation of Management Ability	R,T	Characterizes self as able to and knowledgeable about how to deal effectively with challenging resource management tasks.

Table 2

Course Characteristic Features Assessed

FEATURES	DATA SOURCE: Students	Instructors	Documents	Observations	
DEMANDS INHERENT IN STUDY MATERIALS					
Principle for Selection: Degree to which information tested is drawn in principled (as opposed to random, unpredictable) fashion from reading and lecture material.	✓	✓	✓		
Information Load: Amount of material (from readings and lectures) to be learned over a given period of time.	✓	✓	✓	✓	
Difficulty of Material: Challenge of material to be studied, as determined by abstractness and familiarity of vocabulary in readings and lectures, and comprehensibility of sentences, paragraphs in text and of comparable units in lectures.	✓	✓	✓	✓	
Number of Details Contained in Exam: Total number of factual details covered on exam.	✓	✓	✓		
Number of Sources: Number of sources from which readings to be studied are drawn.			✓		
DEMANDS INHERENT IN PERFORMANCE EVALUATION					
Importance of Rote Knowledge: Relative value of rote knowledge of reading material as reflected in tests and grading.	✓	✓	✓		
Importance of Comprehension Knowledge: Relative value of interpretive or explanatory knowledge of reading material as reflected in tests and grading.			✓		
Importance of Integration: Relative value of relational knowledge and learner-constructed syntheses of reading material as reflected in tests and grading.	✓	✓	✓		
Retention Interval: Length of instructional unit covered by test, in days.			✓		
Congruence of Test Items to Reading: Rating of linkage between content and treatment of material in readings and content of test items.			✓		
Congruence of Test Items to Handouts: Rating of linkage between content and treatment of material on handouts and content of test items.			✓		
Paraphrased Items on Exam: Extent to which exam items paraphrase wording used in the text.			✓		
Weighting of Exam: Contribution of test to total course grade.	✓	✓	✓		
Importance of Test to Students: Student perception of importance of test.	✓				
Competitiveness of Grading: Whether grading policy is absolute or normative.	✓	✓	✓		
Stress Conditions: Extent to which a course is judged to be demanding of self-management resources.	✓	✓	✓		
Premium on Mastery: Extent to which student performance is graded on a mastery model (explicit outcomes, absolute criteria, multiple opportunities to demonstrate proficiency).	✓	✓	✓		

Table 2 (cont.)

FEATURES	DATA SOURCE: Students	Instructors	Documents	Observations	
COGNITIVE SUPPORTS					
Supports for Selection: Extent to which source (instructor or reading) offers guidance for selecting important material.	✓	✓	✓	✓	
Supports for Previewing Text: Extent to which source (instructor or reading) provides advance organizers or outlines before students begin reading assignments.	✓	✓	✓	✓	
Previews of Readings in Class: Extent to which instructor discusses readings before they are assigned.				✓	
Supports for Comprehension: Extent to which source (instructor or reading) encourages or guides students' comprehension of material presented.	✓	✓	✓	✓	
Checks on Comprehension/Memory: Extent to which instructor monitors students' comprehension of reading and lecture material.	✓	✓		✓	
Supports for Memory: Degree to which source (instructor or reading) provides strategies for remembering material.	✓	✓	✓	✓	
Supports for Mnemonics: Degree to which source (instructor or reading) encourages or offers mnemonic strategies (rhymes, jingles, imagery, etc.).	✓	✓	✓	✓	
Interest Level of Material: Extent to which source (readings and lectures) captures the interest of students.	✓				
Redundancy of Coverage: Whether or not material is repeated between sources (readings and lectures.	✓	✓		✓	
Supports for Integration: Extent to which source encourages or guides integration of central ideas	✓	✓	✓	✓	
Integrative Presentation of Material: Extent to which material from different sources (readings and lecture) is integrated for students.	✓	✓	✓	✓	
MANAGEMENT SUPPORTS					
Supports for Time/Effort Management: Extent to which readings or instructor encourage or offer strategies concerning time and effort allocation.	✓	✓		✓	
Extent of Exam Preparation: Amount of class time devoted to test preparation, as a proportion of the instructional unit.	✓	✓		✓	

Table 3

Composite Features Used to Classify Courses

Composite Features	Components
Information Capacity	
Demand for Information Capacity:	Information Load + Details
Net Demand Minus Suports:	Demand for Information Capacity - Selection Supports (Selection Principle + Selection Supports + Preview Support)
Net Demand Minus Compensations:	Demand for Information Capacity - Exam Performance (Test Congruence + Handout Link)
Reading Ability	
Demand for Reading Abilty:	Difficulty of Materials
Net Demand Minus Suports:	Demand for Reading Ability - Comprehension Supports
Net Demand Minus Compensations:	Demand for Reading Abiltiy - Exam Performance (Test Congruence + Handout Link)
Verbatim Processing	
Demand for Verbatim Processing:	Importance of Rote
Net Demand Minus Supports:	Demand for Verbatim Processing - (Memory Supports + Mnemonic Supports)
Net Demand Minus Compensations:	Demand for Verbatim Processing - Exam Performance (Test Congruence + Handout Link)
Comprehension	
Demand for comprehension:	Importance of Comprehension
Net Demand Minus Supports:	Demand for Comprehension - Comprehension Supports
Net Demand Minus Compensations:	Demand for Comprehension - Exam Performance (Test Congruence + Handout Link)
Integration	
Demand for Integraton:	Importance of Integration
Net Demand Minus Supports:	Demand for Integration - Integration Supports
Net Demand Minus Compensations:	Demand for Integration - Integrated Presentation
Retrieval	
Demand for Retrieval:	Retention Interval + Exam Weight
Net Demand Minus Compensations:	Demand for Retrieval - Exam Performance (Test Congruence + Handout Link)
Stress	
Stress:	Competitive Grading
Net Stress Minus Supports:	Stress - Time and Effort Supports
Net Stress Minus Compensations:	Stress - Exam Performance (Test Congruence + Handout Link)

Table 4

Effectiveness & Engagement Relationships for Test Preparation Studying Activities and Course Conditions: Information Capacity

JUNIOR HIGH SCHOOL

	Raw Demand		Supports		Net Demand	
	Effectiveness	Engagement	Effectiveness	Engagement	Effectiveness	Engagemen
Uniform Processing	***0.700***	0.463	0.439	***0.791***	0.453	-0.357
Assiduous Resource Mgt	0.390	0.111	0.047	0.537	0.512	-0.540
Cognitive Monitoring	0.589	0.243	0.480	***0.763***	0.236	*-0.643*
Duplicative Processing	-0.642	0.182	-0.527	0.240	-0.252	-0.047
Focus on Test Relevance	0.523	0.366	0.387	***0.724***	0.261	-0.412
Constructive Processing	-0.049	0.046	0.054	0.466	-0.143	-0.543
Interpretive Processing	-0.125	0.359	-0.276	*0.603*	0.179	-0.263
Verbatim Processing	-0.239	-0.238	-0.635	0.060	0.481	-0.428
Means for Resource Mgt	-0.594	0.020	-0.238	0.434	-0.562	-0.540
Selective Notetaking	-0.036	0.317	0.294	***0.667***	-0.438	-0.409
Self-Eval of Cog. Capab.	0.635	-0.275	0.546	0.127	0.217	-0.570
Self-Eval. Of Self Mgt Capab.	***0.694***	0.284	0.375	0.187	0.529	0.173

SENIOR HIGH SCHOOL

	Raw Demand		Supports		Net Demand	
	Effectiveness	Engagement	Effectiveness	Engagement	Effectiveness	Engnagemen
Uniform Processing	-0.341	-0.316	***0.681***	-0.083	*-0.619*	-0.114
Assiduous Resource Mgt	-0.169	-0.023	0.571	0.010	-0.458	-0.019
Cognitive Monitoring	0.033	-0.242	***0.691***	-0.096	-0.428	-0.066
Duplicative Processing	0.143	-0.351	0.223	-0.280	-0.068	-0.006
Focus on Test Relevance	-0.411	0.329	***0.670***	-0.452	*-0.649*	0.466
Constructive Processing	0.127	0.226	-0.507	-0.511	0.394	0.449
Interpretive Processing	-0.196	0.162	0.218	*-0.580*	-0.244	0.460
Verbatim Processing	-0.308	0.096	-0.159	-0.441	-0.061	0.335
Means for Resource Mgt	0.170	-0.391	-0.009	-0.012	0.096	-0.199
Selective Notetaking	-0.052	0.004	0.357	-0.140	-0.257	0.092
Self-Eval of Cog. Capab.	-0.196	0.267	0.568	-0.243	-0.470	0.298
Self-Eval. Of Self Mgt Capab.	-0.095	0.130	0.473	0.173	-0.355	-0.043

Table 5
Effectiveness & Engagement Relationships for Test Preparation Studying Activities and Course Conditions: Reading Ablity

JUNIOR HIGH SCHOOL

	Raw Demand		Supports		Net Demand	
	Effectiveness	Engagement	Effectiveness	Engagement	Effectiveness	Engagement
Uniform Processing	-0.435	0.017	0.614	0.504	-0.622	*-0.585*
Assiduous Resource Mgt	-0.052	-0.342	0.325	0.567	-0.209	-0.415
Cognitive Monitoring	-0.201	0.145	0.610	0.545	-0.462	***-0.696***
Duplicative Processing	0.112	0.255	-0.041	0.053	0.097	-0.240
Focus on Test Relevance	-0.468	-0.006	0.595	0.393	-0.634	-0.564
Constructive Processing	-0.279	0.011	0.310	0.258	-0.354	-0.230
Interpretive Processing	0.138	0.177	0.407	0.289	-0.124	-0.416
Verbatim Processing	0.404	0.187	-0.249	0.109	0.406	-0.210
Means for Resource Mgt	-0.293	0.340	-0.136	-0.050	-0.124	-0.141
Selective Notetaking	-0.301	-0.076	0.259	0.390	-0.342	-0.398
Self-Eval of Cog. Capab.	-0.190	0.447	***0.770***	-0.046	-0.541	-0.181
Self-Eval. Of Self Mgt Capab.	-0.150	-0.114	0.518	0.192	-0.378	-0.225

SENIOR HIGH SCHOL

	Raw Demand		Supports		Net Demand	
	Effectiveness	Engagement	Effectiveness	Engagement	Effectiveness	Engagement
Uniform Processing	0.035	-0.190	***0.689***	0.170	-0.469	0.191
Assiduous Resource Mgt	***0.678***	-0.113	0.313	0.002	0.206	0.084
Cognitive Monitoring	0.534	-0.089	0.184	0.102	0.206	-0.012
Duplicative Processing	***0.642***	-0.094	-0.228	0.238	0.569	0.281
Focus on Test Relevance	0.382	-0.309	0.488	-0.192	-0.107	0.146
Constructive Processing	0.479	-0.295	-0.233	-0.486	0.469	0.350
Interpretive Processing	**0.861**	-0.108	0.073	-0.478	0.493	0.224
Verbatim Processing	0.538	-0.200	0.063	-0.442	0.295	0.130
Means for Resource Mgt	***0.720***	0.100	-0.187	-0.208	0.589	0.288
Selective Notetaking	0.545	-0.264	0.131	0.040	0.251	0.244
Self-Eval of Cog. Capab.	-0.089	-0.393	0.194	0.111	-0.195	-0.091
Self-Eval. Of Self Mgt Capab.	-0.162	-0.150	0.336	0.351	-0.342	-0.304

Table 6
Effectiveness & Engagement Relationships for Test Preparation Studying Activities and Course Conditions: Verbatim Demands

JUNIOR HIGH SCHOOL

	Raw Demand		Supports		Net Demand	
	Effectiveness	Engagement	Effectiveness	Engagement	Effectiveness	Engagement
Uniform Processing	0.367	0.104	0.205	0.281	0.235	-0.105
Assiduous Resource Mgt	-0.311	-0.307	-0.123	0.136	-0.238	-0.433
Cognitive Monitoring	0.091	-0.067	0.185	0.272	-0.045	-0.280
Duplicative Processing	-0.274	***0.772***	0.472	0.433	-0.654	0.493
Focus on Test Relevance	0.353	0.461	0.370	0.351	0.093	0.223
Constructive Processing	-0.370	-0.111	-0.003	0.170	-0.394	-0.249
Interpretive Processing	0.070	0.408	0.416	0.355	-0.245	0.163
Verbatim Processing	0.281	0.438	0.564	0.365	-0.132	0.187
Means for Resource Mgt	-0.629	-0.427	-0.213	-0.145	-0.508	-0.345
Selective Notetaking	-0.647	0.026	-0.211	0.131	-0.529	-0.073
Self-Eval of Cog. Capab.	***0.689***	0.290	0.577	*0.588*	0.293	-0.142
Self-Eval. Of Self Mgt Capab.	**0.885**	***0.694***	0.421	0.046	0.622	***0.706***

SENIOR HIGH SCHOOL

	Raw Demand		Supports		Net Demand	
	Effectiveness	Engagement	Effectiveness	Engagement	Effectiveness	Engagement
Uniform Processing	0.026	-0.473	0.416	-0.343	-0.255	-0.048
Assiduous Resource Mgt	0.447	-0.367	0.235	-0.109	0.104	-0.139
Cognitive Monitoring	0.466	-0.489	-0.013	-0.086	0.275	-0.224
Duplicative Processing	0.406	-0.146	0.115	-0.053	0.158	-0.049
Focus on Test Relevance	-0.006	-0.288	-0.012	-0.138	0.004	-0.076
Constructive Processing	0.157	-0.196	-0.120	-0.111	0.168	-0.040
Interpretive Processing	0.209	-0.124	0.128	-0.444	0.037	0.217
Verbatim Processing	-0.044	-0.180	0.299	-0.079	-0.219	-0.052
Means for Resource Mgt	0.444	-0.180	0.156	***-0.623***	0.153	0.300
Selective Notetaking	0.462	-0.373	-0.006	-0.213	0.268	-0.076
Self-Eval of Cog. Capab.	-0.033	-0.497	-0.481	0.217	0.293	-0.425
Self-Eval. Of Self Mgt Capab.	-0.193	-0.367	-0.310	0.288	0.091	-0.396

Table 7
Effectiveness & Engagement Relationships for Test Preparation Studying Activities and Course Conditions: Comprehension Demands

JUNIOR HIGH SCHOOL

	Raw Demand		Supports		Net Demand	
	Effectiveness	Engagement	Effectiveness	Engagement	Effectiveness	Engagement
Uniform Processing	-0.059	-0.524	0.614	0.504	-0.452	*-0.585*
Assiduous Resource Mgt	0.292	-0.049	0.325	0.567	-0.094	-0.415
Cognitive Monitoring	-0.233	***-0.710***	0.610	0.545	-0.528	***-0.696***
Duplicative Processing	0.436	-0.453	-0.041	0.053	0.224	-0.240
Focus on Test Relevance	-0.251	*-0.649*	0.595	0.393	-0.525	-0.564
Constructive Processing	-0.043	-0.112	0.310	0.258	-0.234	-0.230
Interpretive Processing	0.141	-0.481	0.407	0.289	-0.219	-0.416
Verbatim Processing	0.193	-0.299	-0.249	0.109	0.260	-0.210
Means for Resource Mgt	0.626	-0.391	-0.136	-0.050	0.376	-0.141
Selective Notetaking	0.263	-0.284	0.259	0.390	-0.062	-0.398
Self-Eval of Cog. Capab.	-0.562	-0.474	***0.770***	-0.046	***-0.787***	-0.181
Self-Eval. Of Self Mgt Capab.	-0.443	-0.204	0.518	0.192	-0.558	-0.225

SENIOR HIGH SCHOOL

	Raw Demand		Supports		Net Demand	
	Effectiveness	Engagement	Effectiveness	Engagement	Effectiveness	Engagement
Uniform Processing	0.067	0.292	***0.689***	0.170	-0.232	0.191
Assiduous Resource Mgt	-0.089	0.095	0.313	0.002	-0.213	0.084
Cognitive Monitoring	-0.121	0.035	0.184	0.102	-0.187	-0.012
Duplicative Processing	-0.579	0.425	-0.228	0.238	-0.424	0.281
Focus on Test Relevance	0.042	0.072	0.488	-0.192	-0.170	0.146
Constructive Processing	-0.157	0.160	-0.233	-0.486	-0.042	0.350
Interpretive Processing	-0.348	0.024	0.073	-0.478	-0.344	0.224
Verbatim Processing	-0.357	-0.064	0.063	-0.442	-0.348	0.130
Means for Resource Mgt	-0.373	0.222	-0.187	-0.208	-0.256	0.268
Selective Notetaking	0.029	0.290	0.131	0.040	-0.029	0.244
Self-Eval of Cog. Capab.	0.409	-0.049	0.194	0.111	0.285	-0.091
Self-Eval. Of Self Mgt Capab.	-0.008	-0.172	0.336	0.351	-0.149	-0.304

Table 8
Effectiveness & Engagement Relationships for Test Preparation Studying Activities and Course Conditions: Integration Demands

JUNIOR HIGH SCHOOL

	Raw Demand		Supports		Net Demand	
	Effectiveness	Engagement	Effectiveness	Engagement	Effectiveness	Engagement
Uniform Processing	-0.444	-0.016	0.413	0.024	**-0.818**	-0.037
Assiduous Resource Mgt	0.222	0.300	0.493	0.518	-0.168	-0.104
Cognitive Monitoring	-0.093	0.240	0.484	-0.070	-0.500	0.316
Duplicative Processing	0.173	***-0.707***	0.398	***-0.734***	-0.142	-0.155
Focus on Test Relevance	-0.374	-0.348	0.475	-0.326	***-0.794***	-0.105
Constructive Processing	0.391	0.122	0.629	0.148	-0.098	0.009
Interpretive Processing	-0.116	-0.338	0.090	-0.292	-0.199	-0.123
Verbatim Processing	-0.353	-0.363	-0.135	*-0.656*	-0.269	0.151
Means for Resource Mgt	0.514	0.569	0.562	-0.123	0.088	***0.713***
Selective Notetaking	0.593	0.015	***0.758***	0.009	0.012	0.009
Self-Eval of Cog. Capab.	-0.640	-0.182	-0.044	-0.373	-0.652	0.112
Self-Eval. Of Self Mgt Capab.	**-0.867**	***-0.686***	-0.303	-0.448	***-0.682***	-0.368

SENIOR HIGH SCHOOL

	Raw Demand		Supports		Net Demand	
	Effectiveness	Engagement	Effectiveness	Engagement	Effectiveness	Engagement
Uniform Processing	0.013	0.349	-0.025	0.178	0.033	0.199
Assiduous Resource Mgt	-0.374	*0.538*	-0.107	-0.053	-0.281	*0.572*
Cognitive Monitoring	-0.286	*0.562*	-0.400	0.198	0.042	0.393
Duplicative Processing	-0.092	-0.136	-0.196	0.511	0.068	*-0.547*
Focus on Test Relevance	0.035	0.301	-0.045	0.162	0.071	0.166
Constructive Processing	-0.224	0.197	0.100	0.211	-0.302	0.023
Interpretive Processing	-0.050	0.127	-0.145	0.078	0.067	0.062
Verbatim Processing	0.069	0.231	0.165	0.170	-0.066	0.090
Means for Resource Mgt	-0.309	0.160	-0.090	-0.128	-0.231	0.261
Selective Notetaking	-0.354	0.378	-0.207	0.075	-0.181	0.311
Self-Eval of Cog. Capab.	-0.042	0.497	-0.288	0.489	0.192	0.093
Self-Eval. Of Self Mgt Capab.	0.147	0.426	-0.243	0.298	0.342	0.178

Table 9
Effectiveness & Engagement Relationships for Test Preparation Studying Activities and Course Conditions: Retrieval Demands

JUNIOR HIGH SCHOOL

	Raw Demand		Supports		Net Demand	
	Effectiveness	Engagement	Effectiveness	Engagement	Effectiveness	Engagement
Uniform Processing	0.344	**0.819**	-0.016	-0.146	0.253	***0.666***
Assiduous Resource Mgt	0.404	***0.686***	-0.391	***-0.681***	0.512	**0.879**
Cognitive Monitoring	0.361	*0.633*	-0.112	-0.233	0.321	*0.584*
Duplicative Processing	0.319	0.252	-0.364	0.513	0.436	-0.117
Focus on Test Relevance	0.109	0.501	0.143	0.156	-0.005	0.266
Constructive Processing	-0.221	***0.753***	-0.280	-0.418	0.005	***0.776***
Interpretive Processing	0.227	***0.697***	-0.258	0.109	0.310	0.432
Verbatim Processing	0.110	0.125	0.433	0.099	-0.172	0.032
Means for Resource Mgt	0.111	0.433	***-0.770***	-0.193	0.523	0.419
Selective Notetaking	0.445	***0.762***	***-0.798***	-0.299	***0.776***	***0.713***
Self-Eval of Cog. Capab.	0.327	0.371	0.264	0.258	0.080	0.115
Self-Eval. Of Self Mgt Capab.	0.095	-0.238	0.528	0.301	-0.237	-0.342

SENIOR HIGH SCHOOL

	Raw Demand		Supports		Net Demand	
	Effectiveness	Engagement	Effectiveness	Engagement	Effectiveness	Engagement
Uniform Processing	0.309	-0.062	***0.607***	0.031	-0.218	-0.085
Assiduous Resource Mgt	-0.089	0.241	***0.617***	0.034	***-0.607***	0.201
Cognitive Monitoring	0.227	0.018	0.583	0.055	-0.276	-0.029
Duplicative Processing	0.002	***-0.624***	0.410	-0.308	-0.345	-0.335
Focus on Test Relevance	0.181	-0.210	0.423	-0.374	-0.185	0.116
Constructive Processing	***-0.726***	-0.118	-0.157	-0.162	-0.560	0.025
Interpretive Processing	-0.163	-0.331	0.424	-0.361	-0.514	-0.011
Verbatim Processing	-0.318	-0.061	0.296	-0.063	-0.554	-0.005
Means for Resource Mgt	-0.342	0.112	0.079	-0.121	-0.393	0.209
Selective Notetaking	-0.160	0.012	0.304	-0.156	-0.410	0.143
Self-Eval of Cog. Capab.	0.455	-0.160	0.247	-0.011	0.225	-0.144
Self-Eval. Of Self Mgt Capab.	0.434	0.044	0.293	0.419	0.167	-0.313

Table 10
Effectiveness & Engagement Relationships for Test Preparation Studying Activities and Course Conditions: Stress Demands

JUNIOR HIGH SCHOOL

	Raw Demand		Supports		Net Demand	
	Effectiveness	Engagement	Effectiveness	Engagement	Effectiveness	Engagement
Uniform Processing	-0.158	-0.491	0.214	0.191	-0.206	-0.322
Assiduous Resource Mgt	0.160	-0.362	0.362	0.126	-0.181	-0.226
Cognitive Monitoring	-0.103	-0.572	0.064	0.130	-0.083	-0.311
Duplicative Processing	-0.235	-0.480	0.362	0.181	-0.336	-0.310
Focus on Test Relevance	-0.301	-0.566	0.214	0.048	-0.262	-0.254
Constructive Processing	0.051	-0.257	-0.139	-0.079	0.114	-0.047
Interpretive Processing	-0.335	-0.432	0.555	0.061	-0.506	-0.210
Verbatim Processing	-0.231	-0.561	***0.690***	0.205	-0.556	-0.358
Means for Resource Mgt	0.232	-0.082	-0.340	-0.095	0.321	0.032
Selective Notetaking	0.173	-0.385	-0.303	0.118	0.272	-0.230
Self-Eval of Cog. Capab.	-0.644	-0.490	0.456	0.006	-0.560	-0.196
Self-Eval. Of Self Mgt Capab.	-0.447	-0.045	0.407	-0.282	-0.450	0.173

SENIOR HIGH SCHOL

	Raw Demand		Supports		Net Demand	
	Effectiveness	Engagement	Effectiveness	Engagement	Effectiveness	Engagement
Uniform Processing	-0.017	-0.447	0.138	-0.201	-0.055	-0.380
Assiduous Resource Mgt	0.467	-0.457	0.314	0.109	0.368	-0.476
Cognitive Monitoring	0.487	-0.508	0.325	-0.065	0.385	-0.477
Duplicative Processing	0.308	0.011	0.362	-0.145	0.200	0.051
Focus on Test Relevance	0.492	-0.446	-0.246	0.096	0.548	-0.461
Constructive Processing	-0.143	-0.512	0.106	0.378	-0.168	***-0.604***
Interpretive Processing	0.180	-0.371	0.065	0.118	0.157	-0.395
Verbatim Processing	-0.269	-0.489	-0.032	0.258	-0.254	*-0.548*
Means for Resource Mgt	0.454	0.107	0.180	-0.325	0.392	0.194
Selective Notetaking	0.356	-0.432	0.393	0.033	0.238	-0.430
Self-Eval of Cog. Capab.	0.335	*-0.529*	-0.180	0.119	0.377	*-0.549*
Self-Eval. Of Self Mgt Capab.	0.050	-0.418	-0.389	0.145	0.157	-0.448